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this solution will serve to determine the limits within which errors in results due to the dropping of higher terms must lie whenever it is possible to determine the limits within which the value of the lowest dropped derivative lies.

NOTE. Mr. Corey informs us that he did not succeed in obtaining a solution until a month after the problem was published, though he had repeatedly attempted to do so. Mr. Corey's solution is quite satisfactory so far as its use for practical computation is concerned, yet greater value would result were an expression found for the remainder after the general term. A prize of $10 is still offered by Mr. Corey for finding an expression for the remainder after the nth term. ED. F.

238. Proposed by PROF. R. D. CARMICHAEL, Anniston, Ala.

Solve the differential equations

$$(a)\quad (x+y^2)dx+(x^2+y)dy=0,$$
$$(b)\quad (x+xy+y^2)dx-(x^2+xy-y)dy=0.$$

Solution by GEORGE W. HARTWELL, Columbia University, New York.

(a) $(x+y^2)dx+(x^2+y)dy=0$.

This equation can be written

$$\frac{dx}{x^2+y}=\frac{dy}{-x-y^2};\ \therefore \frac{dx+dy}{(x-y)\ (x+y-1)}=\frac{xdy+ydx+dx+dy}{(x-y)\,(xy-1)}.$$

Multiplying both members by $x-y$,

$$\frac{dx+dy}{x+y-1}=\frac{xdy+ydx+dx+dy}{xy-1}.$$

Clearing of fractions and transposing,

$$(x+y-1)\,(xdy+ydx)-(xy-1)\,(dx+dy)+(x+y-1)\,(dx+dy)=0.$$

Dividing by $(x+y-1)^2$,

$$\frac{(x+y-1)\ (xdy+ydx)-(xy-1)\ (dx+dy)}{(x+y-1)^2}+\frac{dx+dy}{x+y-1}=0.$$

Integrating, $\dfrac{xy-1}{x+y-1}+\log(x+y-1)=a$. Multiplying by $(x+y-1)$,

$$xy-1+(x+y-1)\log(x+y-1)=a(x+y-1).$$

(b) $(x+xy+y^2)dx-(x^2+xy-y)dy=0$.

This equation can be written

$$\frac{dx}{x^2+xy-y}=\frac{dy}{y^2+xy+x};\ \therefore \frac{dx-dy}{(x+y)\ (x-y-1)}=\frac{xdx+ydy}{(x+y)\ (x^2+y^2)}.$$

Multiplying by $(x+y)$, $\dfrac{dx-dy}{x-y-1}=\dfrac{xdx+ydy}{x^2+y^2}$. Integrating,

$$2\log(x-y-1)=\log(x^2+y^2)+\log a;\ \therefore (x-y-1)^2=a(x^2+y^2).$$

Also solved by G. B. M. Zerr.